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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/771,176

02/03/2004

Chih-Hsing Cheng

SITECH.017CP1CP

9648

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7590

02/10/2006

KNOBBE MARTENS OLSON & BEAR LLP  
2040 MAIN STREET  
FOURTEENTH FLOOR  
IRVINE, CA 92614

EXAMINER

DEGHAN, QUEENIE S

ART UNIT

PAPER NUMBER

1731

DATE MAILED: 02/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/771,176

Applicant(s)

CHENG ET AL.

Examiner

Queenie Dehghan

Art Unit

1731

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 February 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-53 is/are pending in the application.
- 4a) Of the above claim(s) 53 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-52 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 2/3/04 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Election/Restrictions***

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-52, drawn to method for manufacturing a halogen-doped glass, classified in class 65, subclass 17.2.
  - II. Claim 53, drawn to a glass product, classified in class 501, subclass 12.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions Group I and Group II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the product as claimed can be made by another materially different process, such as vapor deposition.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.
4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.
5. During a telephone conversation with Bruce Itchkawitz on January 20, 2006 a provisional election was made with traverse to prosecute the invention of Group 1, claims 1-52. Affirmation of this election must be made by applicant in replying to this

Office action. Claim 53 is withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

#### ***Information Disclosure Statement***

7. The information disclosure statements filed on 4/5/04 and 6/13/05 fail to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered.

#### ***Specification***

8. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

***Claim Rejections - 35 USC § 102***

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1, 3, 21-23, 28-29, 46, and 50-51 are rejected under 35 U.S.C. 102(b) as being anticipated by Rabinovich (4,840,653). Regarding claim 1, Rabinovich discloses a method for manufacturing a halogen-doped glass comprising: providing a gel monolith having a first halogen content (col. 3 lines 10-12); purifying the gel monolith (col. 3 lines 41-47); sintering the gel monolith (col. 3 lines 10-12, col. 4 lines 29, 36) having a second halogen content that is less than the first halogen content (col. 5 line 3-4). Regarding claim 3, Rabinovich discloses a step where the hydroxyl impurity concentration of the gel monolith is reduced by heating to a first temperature in an atmosphere having a chlorine concentration (col. 5 lines 17-21, 25-26). Regarding claims 21, 22 and 23, Rabinovich provides an example where the first halogen is fluorine and the content of the gel monolith comprises approximately 4% fluorine (example 15 and Table II). Regarding claims 28-29, Rabinovich disclose a consolidating step at elevated temperatures (col. 6 lines 18-19), where the fluorine containing gel monolith is exposed to an atmosphere comprising a fluorine containing gas (col. 3 lines 10, 14-15, col. 4 lines 26, 29), such as elemental fluorine and SiF<sub>4</sub> (col. 3 line 16, col. 4 lines 53-59).

2. Claim 52 is rejected under 35 U.S.C. 102(b) as being anticipated by Kyoto et al (5,364,428). Kyoto et al. disclose a method where a porous glass mass made by sol-gel process (col. 3 lines 61-64) is consolidated in an atmosphere of fluorine-containing gas with a partial pressure of 0.05atm (example 5).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (4,840,653), as applied to claim 1 above, in view of Johnson (2,092,163). Rabinovich discloses a method for forming a sol-gel monolith by preparing a first

Art Unit: 1731

substance comprising metal alkoxide (col. 5 lines 33-35), a second substance comprising a catalyst (col. 5 lines 63-65), providing a halogen comprising chemical (col. 3 lines 10-14, 16-18), forming a solution by adding the second substance to the first substance (col. 5 lines 61-62) together with the halogen-comprising chemical (col. 5 lines 26-30), allowing the solution to gel, thereby forming a wet gel monolith (col. 6 lines 9-12), and drying the wet gel monolith (col. 6 lines 12-14). Rabinovich also clearly describes this method in example 5, but does not disclose a cooling step to the mixture. Johnson teach of a cooling step where solutions are cooled to a mixing temperature of 0°C (col. 3 lines 15-21) in the making of gels. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the cooling step of Johnson in the Rabinovich sol-gel process in order to achieve a gel with high porosity, as taught by Johnson.

6. Claims 4-6 and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072) as applied to claims 1 and 3 above, in view of Kirkbir et al. (5,254,508). Rabinovich discloses a method for making fluorine-doped glass comprising of a step where the hydroxyl impurity concentration of the gel monolith is reduced by heating to a first temperature in an atmosphere having a chlorine concentration (col. 5 lines 17-21, 25-26). However, Rabinovich does not mention a specific temperature for the heating step or a following step of oxygenation. Kirkbir et al. teach a process for manufacturing a gel monolith very similar to Rabinovich in example 1. Kirkbir et al. further teaches a step of chlorination to remove hydroxyl groups at the temperature of 700°C (col. 5 lines 30-31, 42-43) and step of oxygenation

Art Unit: 1731

to remove the chlorine impurity in an oxygen atmosphere (col. 3 lines 38-40) at a temperature between 700°C and approximately 950°C (col. 5 lines 31-33, 43-44).

Furthermore, Kirkbir et al. teach of steps where the first and second elevated temperatures are ramped (Figure 2). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the chlorination and oxygenation steps of Kirkbir et al. in the Rabinovich process for making a fluorine-doped sol-gel monolith in order to ensure proper removal of impurities in the glass.

7. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072) as applied to claim 1 above, in view of Wang et al. (5,264,197). Rabinovich discloses a process for manufacturing a fluorine-doped glass comprising of providing a gel monolith, but does not disclose characteristics of the monolith. Wang et al. teach of a gel monolith made by the sol-gel method (col. 1 lines 25-30) with a pore radius of 10nm (diameter = 20nm) (col. 2 lines 19-20) and pores with an average surface area of 550 m<sup>2</sup>/gm (Table 1, example 1). It would have been obvious to one of ordinary skill in the art at the time the invention was made to employ Rabinovich method for manufacturing a gel monolith with a pore diameter of 20nm and pore surface area of 550 m<sup>2</sup>/gm, as taught by Wang et al. in order to achieve a crack-free gel monolith.

8. Claims 7-9, 14-16, 30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072), as applied to claims 1, 3 and 28 above, in view of Kirkbir et al. (5,254,508), as applied to claim 11 above, and in further view of Kyoto et al. (5,364,428). Rabinovich disclose a consolidating step at elevated

Art Unit: 1731

temperatures (col. 6 lines 18-19), where the fluorine containing gel monolith is exposed to an atmosphere comprising a fluorine containing gas (col. 3 lines 10, 14-15, col. 4 lines 26, 29). However, Rabinovich does not mention the pressure or a concentration of the chlorine containing gas and fluorine-containing gas. Kirkbir et al. teach of an oxygenation step to remove the chlorine impurity in an atmosphere with 100% oxygen (col. 3 lines 38-40), but do not mention the pressure or the oxygen atmosphere. Kyoto et al. teach of a step where porous glass mass (col. 3 lines 62-64) is heated in an atmosphere of inert gas with 10% of chlorine and at a pressure of less than atmospheric pressure (col. 7 lines 6-7). Kyoto et al. also teach of a step where the porous glass mass is introduced to an atmosphere of fluorine-containing gas with a pressure of less than atmospheric (col. 8 lines 57-58) during consolidation. Although not explicitly mentioned, the idea of treating porous glass mass at a pressure lower than atmospheric pressure is well taught by Kyoto et al. (col. 3 lines 14-17) and could be inherently used for Kirkbir et al. oxygen atmosphere. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the chlorine concentration and pressure of less than atmospheric pressure of Kyoto in the oxygenation step of Kirkbir et al. and the chlorine- and fluorine-containing gas treatment steps of Rabinovich in order to ensure proper removal of hydroxyl groups by chlorine and subsequently proper removal chlorine by oxygen, so as to prevent bubble in the halogen doped glass. Furthermore, although Kirkbir et al. did not specifically mention an oxygen concentration of approximately 50%, nor did Kyoto et al. specifically mention a concentration of 20-50% fluorine, it would have been obvious to one of ordinary skill in the art at the time the

Art Unit: 1731

invention was made to utilize the proper concentration of each gas in the various purifying and sintering steps of Rabinovich in order to achieve the desired halogen concentration in the final glass product.

9. Claims 24-25, 37- 42 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072), as applied to claims 1 and 21 above, in view of Moore et al. (6,492,072). Rabinovich describes method for manufacturing a fluorine-doped glass via a sol-gel process, but does not disclose the attributes of the glass. Regarding claims 37-42 and 45, Moore et al. teach of a fluorine-doped glass made from a sol-gel method (col. 5 line 62) with attributes, such as an internal transmission at 157nm of at least approximately 89% (col. 11 lines 45-46) through 6.4mm of glass, an index of refraction difference from undoped silica glass of 0.0053 (table 1), an OH content below 1ppm (col. 3 line 52), and a coefficient of thermal expansion of approximately  $0.5 \times 10^{-7}/^{\circ}\text{C}$  (table 1). Regarding claims 24-25, Moore et al. also teach of a glass with a fluorine content of 0.5%wt (col. 5 lines 6-7). It would have been obvious to one of ordinary skill in the art at the time the invention was made to obtain the glass attributes of Moore et al. in fluorine-doped glass of Rabinovich in order to produce a product that has the necessary transmission attributes necessary for operating photo mask blanks at the 157nm wavelength, as taught by Moore et al.

10. Claims 26, 33 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072) and Kyoto et al. (5,364,428), as applied to claims 1, 28, and 30 above, and in further view of Moore et al. (6,492,072). Rabinovich discloses a method for manufacturing a fluorine dope glass where the second fluorine content is

Art Unit: 1731

less than the first after consolidation. Kyoto et al. teach of use of fluorine-containing gas that less than atmospheric and has a concentration that is sufficient to prevent the loss of fluorine containing compound (col. 6 lines 24-26), by gradually replacing the chlorine treatment gas with a fluorine treatment gas and further consolidated under the fluorine containing gas (col. 7 lines 14-21). Regarding claim 33, Moore et al. also teach of the use of fluorine-containing gas in the sintering step of a glass perform (col. 7 lines 32-41). Furthermore, Moore et al. mentions the need for fluorine to present in a particular pressure in order to ensure a desired amount of fluorine is incorporated in the glass (col. 7 lines 23-24). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Moore et al. and Kyoto et al., where glass performs are consolidated in the presence of fluorine-containing gas in Rabinovich process for making fluorine-doped glass, in order to ensure a proper amount of fluorine is still present in the consolidated glass, so bubble formations are minimized.

11. Regarding claims 26 and 36, Kyoto et al. teach of a consolidation step where the temperature is ramped (col.8 lines 58-59) and Moore et al. teach of a glass with a fluorine content of 0.5%wt (col. 5 lines 6-7). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the step of ramping the consolidation temperature, as disclosed by Kyoto et al. to achieve a glass with 0.5%wt fluorine, as mentioned by Moore et al., in Rabinovich method for making a fluorine-doped glass to ensure enough fluorine was still present so as to minimize bubble formations.

12. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072) and Kyoto et al. (5,364,428) and of Moore et al. (6,492,072), as applied to claims 1 and 26 above, and in further view of Susa et al. (4,317,668). Rabinovich, Moore et al. and Kyoto et al. teach the use of a fluorine-containing gas in the consolidation of a fluorine-doped glass at a ramped temperature, but do not mention the ramp rate of the temperature. Susa et al. teach of a temperature ramp during consolidation (col.7 lines 4-5) of 50°C/hr (col. 7 lines 10-12). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the temperature ramp of Susa et al. in Rabinovich, Moore et al. and Kyoto et al. fluorine environment in order to ensure homogenous pore diameters in the consolidated gel monolith, as taught by Susa et al.

13. Claims 43 and 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072), as applied to claim 1 above, in view of Uebbing et al. (6,550,277). Rabinovich discloses a method for manufacturing fluorine-doped glass. Uebbing et al. teach of a glass with an inhomogeneity in the refractive index less than 20ppm (approximately 10ppm) (col. 3 lines 10-11). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make glass with such a low inhomogeneity, in the refractive index, as taught by Uebbing et al. in Rabinovich method to avoid absorptions at the wavelength of 157nm, as taught by Uebbing et al.

14. Claims 31, 34, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072), in view of Kyoto et al. (5,364,428) as applied to claims 1, 28 and 30, and in further view of Uebbing et al. (6,550,277). Rabinovich

Art Unit: 1731

disclose a consolidating step at elevated temperatures (col. 6 lines 18-19), where the fluorine containing gel monolith is exposed to an atmosphere comprising a fluorine containing gas (col. 3 lines 10, 14-15, col. 4 lines 26, 29). Kyoto et al. teach of a step where the porous glass mass is introduced to an atmosphere of fluorine-containing gas with a pressure of less than atmospheric (col. 8 lines 57-58). However, neither Rabinovich nor Kyoto et al. mention the concentration of the fluorine-containing gas or an elevated temperature in the range of 950°C and 1100°C. Uebbing et al. teach the use of fluorine containing gas concentration of 10% at an elevated temperature of 1000°C (col. 5 lines 53-55). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the fluorine containing gas concentration and elevated temperature of Uebbing et al. in the fluorine atmosphere of Kyoto and Rabinovich to ensure enough fluorine was still present in the glass so as to minimize bubble formations.

15. Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072), as applied to claim 1 above, in view of Schermerhorn et al. (4,789,389) and Aramaki et al. (Pat. Pub.2003/0226996). Rabinovich discloses a method for manufacturing a halogen-doped glass comprising a gel monolith having a halogen content (col. 3 lines 10-12), where the halogen is fluorine. Rabinovich does not teach the use of other halogens such as Iodine or Bromine. Schermerhorn teach of the use of bromine as dopant (col. 18 lines 49-53) in the preparation of a sol gel solution (col. 6 lines 37-38). Aramaki et al. teach doping a semiconductor with Iodine ([0190]) using a production process from a solution, such as sol-gel. It would have been obvious

to one of ordinary skill in the art at the time of the invention was made to utilize various dopants, such as the Bromine of Schermerhorn or the Iodine of Aramaki et al. in Rabinovich method for preparing a gel monolith, in order to achieve the desired properties of the glass, such as electroconductivity.

16. Claims 47 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072), as applied to claim 46 above, and in view of Kyoto et al. (5,364,428) and Moore et al. (6,492,072). Rabinovich discloses a method for manufacturing a halogen-doped glass comprising: providing a gel monolith having a first halogen content (col. 3 lines 10-12); purifying the gel monolith (col. 3 lines 41-47); sintering the gel monolith (col. 3 lines 10-12, col. 4 lines 29, 36) having a second halogen content that is less than the first halogen content (col. 5 line 3-4). Furthermore, Rabinovich discloses a consolidating step at elevated temperatures (col. 6 lines 18-19), where the fluorine containing gel monolith is exposed to an atmosphere comprising a fluorine containing gas (col. 3 lines 10, 14-15, col. 4 lines 26, 29). However, Rabinovich does not disclose a ramping of the temperature. Kyoto et al. teach of consolidation step where the temperature is ramped (col.8 lines 58-59) and Moore et al. teach of a glass with a (preselected value) fluorine content of 0.5%wt (col. 5 lines 6-7). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the step of ramping the consolidation temperature, as disclosed by Kyoto et al. to achieve a glass with 0.5%wt fluorine, as mentioned by Moore et al., in Rabinovich method for making a fluorine-doped glass to ensure enough fluorine was still present so as to minimize bubble formations.

Art Unit: 1731

17. Claim 49 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rabinovich (6,492,072) as applied to claim 46 above, in view of Kirkbir et al. (5,254,508). Rabinovich discloses a step where the hydroxyl impurity concentration of the gel monolith is reduced by heating to a first temperature in an atmosphere having a chlorine concentration (col. 5 lines 17-21, 25-26), but does not mention the removal of chlorine impurity. Kirkbir et al. also teach a step of chlorination to remove hydroxyl groups at the temperature of 700°C (col. 5 lines 30-31, 42-43), followed by a step of oxygenation to remove the chlorine impurity in an oxygen atmosphere (col. 3 lines 38-40) at a temperature between 700°C and approximately 950°C (col. 5 lines 31-33, 43-44). It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the chlorination and oxygenation steps of Kirkbir et al. in the Rabinovich process for making a fluorine-doped sol-gel monolith in order to ensure proper removal of impurities in the glass.

### ***Conclusion***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Queenie Dehghan whose telephone number is (571)272-8209. The examiner can normally be reached on Monday through Friday 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1731

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Q Dehghan

  
STEVEN P. GRIFFIN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700